

## PART I

### 1 GENERAL COMMISSIONING REQUIREMENTS

#### 1.1 Description of Work

- a) The purpose of the commissioning process is to provide the owner/operator with assurance that the systems have been installed according to the contract documents, and operate within the performance guidelines set out in the Basis of Design (BoD) and these specifications. The Independent Commissioning Authority (CxA) will provide the owner with an unbiased, objective view of the system's installation, operation, and performance. The commissioning process does not take away or reduce the responsibility of the installing contractors to provide a finished project, installed, and fully functional in accordance with the contract documents.

Commissioning is intended to enhance the quality of system start-up and aid in the orderly completion and transfer of systems for beneficial use by the owner. The CxA will be the leader of the commissioning team, planning and coordinating all commissioning activities in conjunction with the design professionals, construction manager, subcontractors, manufacturers, and equipment suppliers.

The construction manager, general contractor, and sub-contractors shall be responsible for cooperating, and coordinating their work, with the CxA. They shall also be responsible for carrying out all the physical activities required for installation of components and systems, and operating them during the commissioning process as required in this Section.

#### 1.2 Related Documents

- a) Drawings and general provisions of the contract, including general and supplementary conditions and applicable Division 01 apply to work of this section.
- b) OPR and BoD documentation are included by reference for information only.

### 1.3 Related Specifications

- a) This section includes general requirements that apply to implementation of the commissioning process without regard to specific systems, assemblies, and components.
- b) Related Sections include the following:
  - 1. Division 01, Section “Facility Substructure Commissioning” for commissioning process activities for foundations and basement systems and assemblies.
  - 2. Division 01, Section “Facility Shell Commissioning” for commissioning process activities for superstructure, exterior enclosure, and roofing systems and assemblies.
  - 3. Division 01, Section “interiors Commissioning” for commissioning process activities for interior construction, stairways, and interior finishes systems and assemblies.
  - 4. Division 14, Section “Commissioning of Conveying Equipment” for commissioning process activities for dumbwaiters, elevators, escalators, and moving walks, lifts, turntables, and scaffolding systems, assemblies, equipment, and components.
  - 5. Division 21, Section “Commissioning of Fire Suppression” for commissioning process activities for fire suppression systems, assemblies, equipment, and components.
  - 6. Division 22, Section “Commissioning of Plumbing” for commissioning process activities for plumbing systems, assemblies, equipment, and components.
  - 7. Division 23, Section “Commissioning of HVAC & R” for commissioning process activities for commissioning heating, ventilating, air-conditioning, and refrigeration systems, assemblies, equipment, and components.
  - 8. Division 25, Section “Commissioning of Integrated Automation” for commissioning process activities for commissioning integrated automation systems, assemblies, equipment, and components.
  - 9. Division 26, Section “Commissioning of Electrical” for commissioning process activities for electrical systems, assemblies, equipment, and components.

10. Division 27, Section “Commissioning of Communications” for commissioning process activities for communication systems, assemblies, equipment, and components.
11. Division 28, Section “Commissioning of Electronic Safety and Security” for commissioning process activities for electronic safety and security systems, assemblies, equipment, and components.
12. Division 33, Section “Commissioning of Utilities” for commissioning process activities for water, wells, sanitary sewerage, storm drainage, fuel distribution, hydronic and stem energy, electrical, and communications utilities systems, assemblies, equipment, and components.

#### 1.4 Definitions

- a) BoD: Basis of Design. A document, prepared by Architect, that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- b) Commissioning Plan: A document, prepared by CxA, that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- c) CxA: Commissioning Authority.
- d) OPR: Owner’s Project Requirements. A document, prepared by the Owner, that details the functional requirements of the Project and expectations of how it will be used and operated. This document includes Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- e) Systems, Assemblies, Equipment, and Components: Where these terms are used together or separately, they shall mean “as-built” systems, assemblies, equipment, and components.

#### 1.5 Commissioning Team

- a) Members Appointed by Contractor (s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representative

of *each* contractor, including project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

b) Members Appointed by Owner:

1. CxA: An entity identified by the Owner that leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.6 Owner's Responsibilities

- a) Provide the OPR documentation to the CxA and *each* contractor for information and use.
- b) Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

Coordinate activities specified in paragraph below with Owner-Architect and Architect-Consultant agreements.

- c) Provide the BoD documents, prepared by Architect and approved by Owner, to the CxA and *each* contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.7 Contractors Responsibilities

- a) Each Contractor and their subcontractors shall assign representatives with expertise and authority to act on their behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to the following:
  1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
  2. Cooperate with CxA for resolution of issues recorded in "Issues Log."
  3. Attend and participate in commissioning team meetings held [weekly] [biweekly] [monthly] [variable] <insert frequency>.

4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review and accept construction checklists provided by the commissioning authority.
6. Complete [paper] [electronic] construction checklists as work is completed and provide to the commissioning authority on a [daily] [weekly] <insert frequency> basis.
7. Review and accept commissioning process test procedures provided by the commissioning authority.
8. Accomplish commissioning process test procedures.

#### 1.8 CxA Responsibilities

- a) Organize and lead the commissioning team.
- b) Provide commissioning plan.
- c) Convene commissioning team meetings.
- d) Provide project-specific construction checklists and commissioning process test procedures.
- e) Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1% to 100%. Verification will include, but is not limited to equipment submittals, construction checklists, training, operating, and maintenance data, tests, and test report to verify compliance with the OPR. When a random sample does not meet the requirement, CxA will report the failure in the "Issues Log."
- f) Prepare and maintain issues log.
- g) Prepare and maintain completed construction checklist log.
- h) Witness systems, assemblies, equipment, and component start up.
- i) Compile test data, inspection reports, and certificates, and include them in the systems manual and commissioning report.

#### 1.9 References

- a) Associated Air Balance Council Commissioning Guideline / ASHRAE Guideline 1.

## PART 2

### 1 PRODUCTS

#### 2.1 Systems to be commissioned.

- a) All systems identified in Part 1 – Related Specifications are to be inspected, tested, signed off as complete and operational, and operated for the Commissioning Authority verification as described in Part 3 of this section. The work in Part 2 indicates the key components of the commissioning plan that is to be developed by the Commissioning Authority (CxA).

#### 2.2 Document Review

- a) The CxA will review the OPR and BoD to obtain a full and complete understanding of the project requirements. The CxA will review the design documents to verify the OPR has been addressed and that adequate testing can be performed in order to document that the systems, equipment, and components will comply with the OPR and BoD.
- b) The CxA will review the design documents for equipment accessibility for testing, service and maintenance.
- c) The CxA will review equipment submittals for use in developing testing procedures used in the commissioning plan.

#### 2.3 Commissioning Schedule

- a) The CxA shall develop a commissioning schedule to parallel the construction schedule. This schedule will include, but will not be limited to the following:
  1. All commissioning meetings.
  2. Construction review and static testing.
  3. Pre-start and start up check list procedures.
  4. System operational verifications.
  5. Functional performance and acceptance testing.
  6. Owner training.
  7. Special testing.
  8. Off-season testing.

- b) The schedule will be reviewed and adjusted as needed at each commissioning meeting.

#### 2.4 Commissioning Meetings

- a) The CxA will schedule regular commissioning meetings. These meetings are designed to keep the commissioning events on schedule and will be attended by all team members.
- b) The “kick-off” meeting will be scheduled early in construction to review the commissioning plan and to bring all team members together.
- c) Regular meetings will be scheduled once a month, early in the construction, and becoming more frequent (once a week) as start up of the equipment approaches.
- d) Meetings will review the schedule, IRT list, and other relevant matters to the commissioning.

#### 2.5 Resolution Tracking Form (RTF)

- a) The CxA will develop an RTF format to document each issue, non-compliance item, or deficiency encountered during the commissioning process. The RTF format will include:
  - 1. A specific and individual number for each issue.
  - 2. A description of the issue.
  - 3. The date the issue was discovered.
  - 4. The party responsible for resolving the issue.
  - 5. The date the issue was corrected by the responsible party.
  - 6. The date of the final verification by the CxA as complete.
- b) The RTF will be reviewed at each commissioning meeting to assure issues are on track and completed in a timely manner.

#### 2.6 Construction Reviews

- a) The CxA shall review the construction from time to time to observe:
  - 1. The general installation.
  - 2. The installation prior to burial or concealment.
  - 3. To witness static testing (duct, hydronic, etc).
- b) The results of the reviews and tests will be included in the final commissioning report.
- c) All issues encountered will be included on the Issue Resolution Tracking form.

## 2.7 System Verification Checklist

- a) The CxA will develop system verification checklists (SVC) for each piece of equipment to be started up. The SVC will include a pre-start check, as well as start up data to document the proper procedures used per the specification and the equipment manufacturer.
- b) The CxA will witness and sign off on the SVC along with the representative contractors responsible for the start up procedures.
- c) Any issues discovered during the pre-start and start up SVC's will be entered on the Issue Resolution Tracking form (IRT) for resolution prior to continuing with the SVC.

## 2.8 Functional Performance Testing (FPT)

- a) The CxA will develop functional performance tests to challenge each component, piece of equipment, and system.
- b) The FPT will be conducted by the CxA with each associated contractor in attendance to operate the equipment for the test.
- c) Any equipment or devices necessary to provide artificial loading will be provided by the contractor.

## 2.9 Owner Training and O & M Data

- a) The CxA will schedule the contractors and vendors for all O & M training.
- b) The CxA will video record all training sessions.
- c) The contractor will supply all O & M data to the CxA prior to the completion of construction.

## 2.10 Off- Season Testing

- a) The CxA will plan for any off-season testing that may be required to properly test any system, equipment, or component.
- b) The CxA will notify the appropriate contractor of the off-season test requirement.
- c) The off-season test will be reported as an addendum to the commissioning report.

## 2.11 Commissioning Report

- a) The commissioning report will include a narrative description of all systems, equipment, and components for each division of the specifications commissioned. In addition, the commissioning report will include, but will not be limited to the following:



1. Executive Summary
2. Meeting Minutes
3. Owner's Project Requirements Reviews
4. Design Reviews
5. Submittal Reviews
6. Construction checklist.
7. Resolution Tracking Forms (RTF).
8. System Verification Checklist (SVC).
9. Start-Up, Point-to-Point/Sequence Verification and TAB reports.
10. Function Performance Testing (FPT).
11. O & M data and
12. Training Audio/Visual Documentation
13. Systems Manual
14. Off-Season Mode Tests/Training Reports
15. Near End of Warranty Review Report